Federal Energy Management Program

FEMP Designated Product:
Residential Gas Furnaces

Leading by example, saving energy and taxpayer dollars in federal facilities

Purchasing Specifications for Energy-Efficient Products

Legal Authorities

Federal agencies are required by the National Energy Conservation Policy Act (P.L. 95-619), Executive Order 13423 and Federal Acquisition Regulations (FAR) Subpart 23.2 and 53.223 to specify and buy ENERGY STAR®-qualified products or, in categories not included in the ENERGY STAR program, FEMP-designated products which are among the highest 25 percent of equivalent products for energy efficiency.

Performance Requirements for Federal Purchases

Product Type	Required AFUE[a]
Gas Furnaces	90.0% or more

a) AFUE, or Annual Fuel Utilization Efficiency, is the ratio of the annual heat output of the furnace compared to the total fuel input. Based on DOE test procedure, see 10- CFR 430, Sub-part B, Appendix N.

Buying Energy-Efficient Gas Furnaces

This *Specification* applies to residential furnaces that operate on propane or natural gas and have heat input rates less than 225,000 British Thermal Units per hour (Btuh). When buying gas furnaces directly from commercial sources, specify or select products that are ENERGY STAR®-qualified (see *For More Information*) or meet the *Performance Requirements* shown above. Look for the Annual Fuel Utilization Efficiency, or AFUE, on the yellow EnergyGuide label required on these products.

These *Performance Requirements* apply to all forms of procurements, including: guide and project specifications; construction, renovation, repair, energy service, and operation & maintenance contracts; lease agreements and in all evaluations of solicitation responses. Model language to assist agencies with incorporating these *Performance Requirements* into procurement documents is available at www1.eere.energy.gov/femp/procurement/eep_modellang.html. Agencies can claim an exception to these requirements through a written finding that no ENERGY STAR-qualified or FEMP-designated product is available or life cycle cost effective for the specific application.

Buyer Tips

All models that meet these *Performance Requirements* are "condensing" furnaces. This technology takes advantage of normally exhausted heat in the furnace's flue gas to improve efficiency. When installing condensing furnaces, select products that feature "sealed combustion." Condensing furnaces should not use indoor air, which frequently contain contaminants from common household products, for combustion. These contaminants can cause corrosion and damage condensing furnaces. Furnaces with sealed combustion have supply lines that bring outdoor air directly to the combustion chambers.

In addition to improving efficiency, condensing furnaces with sealed combustion are safer. The supply lines, combustion chambers and flues are sealed from the inside of homes thus preventing exhaust gases from leaking or being back drafted into occupied spaces. Due to these features, condensing furnaces require slight modifications with installation and are usually more expensive than standard efficiency models.

When buying or specifying new gas furnaces, consider the efficiency of the blower fans as well. The electrical energy used to run these fans and distribute the heated air throughout homes can be substantial. The Consortium for Energy Efficiency (CEE) and Gas Appliance Manufacturing Association (GAMA) recommend that annual electricity use (E_{AE}) be less than or equal to 2% of the total annual energy use of the furnace. To find qualified products, go to the GAMA Web site and download their *Consumer's Directory of Certified*

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Efficiency Ratings for Heating and Water Heating Equipment (see *For More Information*). Models designated with an "e" in the E_{AE} column meet this criterion.

An efficient furnace will not save energy or money if it is not properly installed. Federal procurement officers and buyers should require that gas furnaces be installed in accordance with the "HVAC Quality Installation (QI) Specification" published by the Air Conditioning Contractors of America (see *For More Information*). Installation problems like oversizing, poorly designed distribution systems and leaky ducts result in efficiency loses, occupant discomfort and shortened equipment life. Requiring the contractor to follow the QI specification will assure that these and other problems are addressed and the energy and cost savings achieved.

User Tips

Properly sealing the building envelope and weather-stripping doors and windows can result in additional savings. Consider leaving your furnace off during unoccupied hours or using a programmable thermostat to minimize unnecessary operation. Regular maintenance is necessary to maintain peak performance.

Cost-Effectiveness Example

Performance	Base Model	Required	Best Available[b]
Annual Fuel Utilization Efficiency[a]	80%	90%	95%
Annual Natural Gas Use	750 therms	660 therms	635 therms
Annual Natural Gas Cost	$750	$660	$635
Annual Natural Electricity Use	1,200 kWh	990 kWh	225 kWh
Annual Natural Electricity Cost	$96	$80	$18
Lifetime Energy Cost[c]	$11,730	$10,230	$9,030
Lifetime Energy Cost Savings	**-**	**$1,500**	**$2,700**

a) From GAMA's *Consumer's Directory of Certified Efficiency Ratings for Heating and Water Heating Equipment*.

b) More efficient products may have been introduced to the market since this *Specification* was published.

c) Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed furnace life of 20 years. Future natural gas and electricity price trends and a discount rate of 3.0% are based on federal guidelines (effective from April, 2008 to March, 2009).

Cost-Effectiveness Assumptions

Annual energy use in this example is based on the standard DOE test procedure for a non-weatherized furnace configured with an upward airflow and heating capacity of 72,000 Btuh. Operating hours are assumed to be 2,080 hours per year. The assumed price for natural gas is $1.00 per therm and electricity is $8¢ per kilowatt-hour, the average rates for federal facilities throughout the United States. The efficiency of the *Base Model* meets current US DOE appliance standards. The efficiency of the *Required* model meets this *Specification* and is equipped with a standard fan motor. The *Best Available* represents the most efficient product on the market for this size class that also meets the CEE/GAMA annual electricity use (E_{AE}) criterion.

Using the Cost-Effectiveness Table

In the example shown above, the *Required* furnace is cost-effective if its purchase price is no more than $1,500 above that of the *Base Model*. The *Best Available* is cost effective if its purchase price is no more than $2,700 above that of the *Base Model*.

What if my Electricity Price or Operating Hours are different?

ENERGY STAR has an Excel-based cost calculator for furnaces on its Web site. Go to www.energystar.gov/index.cfm?c=furnaces.pr_furnaces and click on "Savings Calculator" in the column on the right. Input the appropriate location of your facility and rate for natural gas. The Output section will automatically display results that more accurately reflect your energy use and cost.

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For More Information:

EERE Information Center
1-877-EERE-INF or 1-877-337-3463
www.eere.energy.gov/femp/procurement/

Lawrence Berkeley National Laboratory provided market research and life cycle cost analysis in support of this *Specification*.
(202) 488-2250

EPA/DOE ENERGY STAR
(888) 782-7937
www.energystar.gov/

General Services Administration
www.gsa.gov/
www.gsaadvantage.gov/

Consortium for Energy Efficiency (CEE)
(617) 589-3949
www.cee1.org/

Gas Appliances Manufacturers Association (GAMA)
(703) 525-7060
www.gamanet.org/

Air Conditioning Contractors of America (ACCA)
(202) 483-9370
www.acca.org/

American Council for and Energy Efficient Economy (ACEEE) publishes the *Consumer's Guide to Home Energy Savings* which contains a chapter on heating systems. This guide is available from ACEEE at:
(202) 429-0063
www.aceee.org/

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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